

TCEQ Interoffice Memorandum

To: Tony Walker
Director, TCEQ Region 4, Dallas/Fort Worth
Alyssa Taylor
Special Assistant to the Regional Director, TCEQ Region 4, Dallas/Fort Worth

From: Heather Reddick Schaefer, DrPH *HR*
Toxicology Division, Office of the Executive Director

Date: July 6, 2017

Subject: Toxicological Evaluation of Results from an Ambient Air Sample for Volatile Organic Compounds Collected downwind of C&J Well Services Inc. - C&J Aledo Facility FW SWD 1 (Latitude 32.717711, Longitude -97.533795) near Aledo, Tarrant County, Texas

Sample Collected on June 1, 2017, Request Number 1706001 (Lab Sample 1706001-001)

Key Points

- Reported concentrations of target volatile organic compounds (VOCs) were either not detected or were detected below levels of short-term health and/or welfare concern.

Background

On June 1, 2017, a Texas Commission on Environmental Quality (TCEQ) Region 4 air investigator collected a 30-minute canister sample (Lab Sample 1706001-001) downwind of C&J Well Services Inc. - C&J Aledo Facility FW SWD 1 near Aledo, Tarrant County, Texas (Latitude 32.717711, Longitude -97.533795). The sample was collected in response to a citizen complaint of a foul odor. The investigator experienced a very light, intermittent, asphalt like odor but no health effects while sampling. Meteorological conditions measured at the site or nearest stationary ambient air monitoring site indicated that the ambient temperature was 82°F with a relative humidity of 65%, and winds were from the west northwest (270°) at 2.5 miles per hour. The sampling site and the nearest location where the public could have access was 101-300 feet from the possible emission sources (multiple). The sample was sent to the TCEQ laboratory in Austin, Texas, and analyzed for a range of VOCs. The list of the target analytes that were evaluated in this review is provided in Attachment A. The VOC concentrations were reported in parts per billion by volume (ppbv) (Attachment B and Table 1). Please note that the available canister technology and analysis method cannot capture and/or analyze for all chemicals.

Results and Evaluation

Reported VOC concentrations were compared to TCEQ's short-term health- and/or welfare-based air monitoring comparison values (AMCVs) (Table 1). Short-term AMCVs are guidelines used to evaluate ambient concentrations of a chemical in air and to determine its potential to result in adverse health effects, adverse vegetative effects, or odors. Health AMCVs are set to provide a margin of safety and are set well below levels at which adverse health effects are reported in the scientific literature. If a chemical concentration in ambient air is less than its comparison value, no adverse health effects are expected to occur. If a chemical concentration exceeds its comparison value it does not necessarily mean that adverse effects will occur, but rather that further evaluation is warranted.

All of the 84 VOCs were either not detected or were detected below their respective short-term AMCVs. Exposure to levels of VOCs measured in this sample would not be expected to cause short-term adverse health effects, adverse vegetative effects, or odors.

Please call me at (512) 239-0154 if you have any questions regarding this evaluation.

List of Target Analytes for Canister Samples

ethane	4-methyl-1-pentene	t-1,3-dichloropropylene
ethylene	1,1-dichloroethane	1,1,2-trichloroethane
acetylene	cyclopentane	2,3,4-trimethylpentane
propane	2,3-dimethylbutane	toluene
propylene	2-methylpentane	2-methylheptane
dichlorodifluoromethane	3-methylpentane	3-methylheptane
methyl chloride	2-methyl-1-pentene + 1-hexene	1,2-dibromoethane
isobutane	n-hexane	n-octane
vinyl chloride	chloroform	tetrachloroethylene
1-butene	t-2-hexene	chlorobenzene
1,3-butadiene	c-2-hexene	ethylbenzene
n-butane	1,2-dichloroethane	m & p-xylene
t-2-butene	methylcyclopentane	styrene
bromomethane	2,4-dimethylpentane	1,1,2,2-tetrachloroethane
c-2-butene	1,1,1-trichloroethane	o-xylene
3-methyl-1-butene	benzene	n-nonane
isopentane	carbon tetrachloride	isopropylbenzene
trichlorofluoromethane	cyclohexane	n-propylbenzene
1-pentene	2-methylhexane	m-ethyltoluene
n-pentane	2,3-dimethylpentane	p-ethyltoluene
isoprene	3-methylhexane	1,3,5-trimethylbenzene
t-2-pentene	1,2-dichloropropane	o-ethyltoluene
1,1-dichloroethylene	trichloroethylene	1,2,4-trimethylbenzene
c-2-pentene	2,2,4-trimethylpentane	n-decane
methylene chloride	2-chloropentane	1,2,3-trimethylbenzene
2-methyl-2-butene	n-heptane	m-diethylbenzene
2,2-dimethylbutane	c-1,3-dichloropropylene	p-diethylbenzene
cyclopentene	methylcyclohexane	n-undecane

July 6, 2017

Attachment B

6/13/2017

Texas Commission on Environmental Quality

Laboratory and Quality Assurance Section

P.O. Box 13087, MC-165

Austin, Texas 78711-3087

(512) 239-1716

Laboratory Analysis Results

Request Number: 1706001

Request Lead: Frank Martinez

Region: T04

Date Received: 6/2/2017

Project(s): Barnett Shale

Facility(ies) Sampled	City	County	Facility Type
C&J Aledo Facility FW SWD 1, RN105863344	Aledo	Tarrant	

Sample(s) Received

Field ID Number: N0613-245-0601

Laboratory Sample Number: 1706001-001

Sampled by: Julian Holmes

Sampling Site:

Date & Time Sampled: 06/01/17 10:41:00 Valid Sample: Yes

Comments: Canister N0613 was used to collect a 30-minute downwind sample using OFC-245.

Requested Laboratory Procedure(s):

Analysis: AP001VOC

Determination of VOCs in Canisters by GC/MS Using Modified Method TO-15

Please note that this analytical technique is not capable of measuring all compounds which might have adverse health effects. For questions on the analytical procedures please contact the laboratory manager at (512) 239-1716. For an update on the health effects evaluation of these data, please contact the Toxicology Division at (512) 239-1795.

Analyst:

Jaydeep Patel
Jaydeep PatelDate: 06/13/17

Laboratory Manager:

Frank Martinez
Frank MartinezDate: 6/13/17

Laboratory Analysis Results

Request Number: 1706001

Analysis Code: AP001VOC

Note: Results are reported in units of ppbv

Lab ID	1706001-001									
Field ID	N0613-245-0601									
Canister ID	N0613									
Compound	Conc.	SDL	SQL	Analysis Date	Flags**	Conc.	SDL	SQL	Analysis Date	Flags**
ethane	16	1.0	2.4	6/7/2017	T,D1					
ethylene	ND	1.0	2.4	6/7/2017	T,D1					
acetylene	ND	1.0	2.4	6/7/2017	T,D1					
propane	6.0	1.0	2.4	6/7/2017	T,D1					
propylene	ND	1.0	2.4	6/7/2017	T,D1					
dichlorodifluoromethane	0.50	0.40	1.2	6/7/2017	L,D1					
methyl chloride	0.60	0.40	1.2	6/7/2017	L,D1					
isobutane	0.88	0.46	2.4	6/7/2017	L,D1					
vinyl chloride	ND	0.34	1.2	6/7/2017	D1					
1-butene	0.20	0.40	1.2	6/7/2017	J,D1					
1,3-butadiene	ND	0.54	1.2	6/7/2017	D1					
n-butane	1.5	0.40	2.4	6/7/2017	L,D1					
i-2-butene	ND	0.36	1.2	6/7/2017	D1					
bromomethane	ND	0.54	1.2	6/7/2017	D1					
c-2-butene	ND	0.54	1.2	6/7/2017	D1					
3-methyl-1-butene	ND	0.46	1.2	6/7/2017	D1					
isopentane	0.87	0.54	4.8	6/7/2017	L,D1					
trichlorofluoromethane	0.22	0.58	1.2	6/7/2017	J,D1					
1-pentene	ND	0.54	1.2	6/7/2017	D1					
n-pentane	1.1	0.54	4.8	6/7/2017	L,D1					
isoprene	0.08	0.54	1.2	6/7/2017	J,D1					
i-2-pentene	ND	0.54	2.4	6/7/2017	D1					
1,1-dichloroethylene	ND	0.36	1.2	6/7/2017	D1					
c-2-pentene	ND	0.50	2.4	6/7/2017	D1					
methylene chloride	0.07	0.28	1.2	6/7/2017	J,D1					
2-methyl-2-butene	ND	0.46	1.2	6/7/2017	D1					
2,2-dimethylbutane	0.05	0.42	1.2	6/7/2017	J,D1					
cyclopentane	ND	0.40	1.2	6/7/2017	D1					
4-methyl-1-pentene	ND	0.44	2.4	6/7/2017	D1					
1,1-dichloroethane	ND	0.38	1.2	6/7/2017	D1					
cyclopentane	0.08	0.54	1.2	6/7/2017	J,D1					
2,3-dimethylbutane	0.10	0.56	2.4	6/7/2017	J,D1					
2-methylpentane	0.94	0.54	1.2	6/7/2017	L,D1					
3-methylpentane	0.68	0.46	1.2	6/7/2017	L,D1					
2-methyl-1-pentene + 1-hexene	ND	0.40	4.8	6/7/2017	D1					
n-hexane	1.9	0.40	2.4	6/7/2017	L,D1					
chloroform	ND	0.42	1.2	6/7/2017	D1					
c-2-hexene	ND	0.54	2.4	6/7/2017	D1					
c-2-hexene	ND	0.54	2.4	6/7/2017	D1					
1,2-dichloroethane	ND	0.54	1.2	6/7/2017	D1					
methylcyclopentane	0.50	0.54	2.4	6/7/2017	J,D1					
2,4-dimethylpentane	0.08	0.54	2.4	6/7/2017	J,D1					
1,1,1-trichloroethane	0.01	0.52	1.2	6/7/2017	J,D1					
benzene	0.20	0.54	1.2	6/7/2017	J,D1					
carbon tetrachloride	0.09	0.54	1.2	6/7/2017	J,D1					
cyclohexane	0.71	0.48	1.2	6/7/2017	L,D1					
2-methylhexane	0.89	0.54	1.2	6/7/2017	L,D1					
2,3-dimethylpentane	0.15	0.52	1.2	6/7/2017	J,D1					

Laboratory Analysis Results

Request Number: 1706001

Analysis Code: AP001VOC

Note: Results are reported in units of ppbv

Lab ID	1706001-001									
Compound	Conc.	SDL	SQL	Analysis Date	Flags**	Conc.	SDL	SQL	Analysis Date	Flags**
3-methylhexane	0.85	0.40	1.2	6/7/2017	L,D1					
1,2-dichloropropane	ND	0.34	1.2	6/7/2017	D1					
trichloroethylene	0.01	0.58	1.2	6/7/2017	J,D1					
2,2,4-trimethylpentane	0.04	0.48	1.2	6/7/2017	J,D1					
2-chloropentane	ND	0.54	1.2	6/7/2017	D1					
n-heptane	1.6	0.50	2.4	6/7/2017	L,D1					
c-1,3-dichloropropylene	ND	0.40	1.2	6/7/2017	D1					
methylcyclohexane	1.4	0.52	2.4	6/7/2017	L,D1					
t-1,3-dichloropropylene	ND	0.40	1.2	6/7/2017	D1					
1,1,2-trichloroethane	ND	0.42	1.2	6/7/2017	D1					
2,3,4-trimethylpentane	0.02	0.48	2.4	6/7/2017	J,D1					
toluene	0.57	0.54	1.2	6/7/2017	L,D1					
2-methylheptane	0.83	0.40	2.4	6/7/2017	L,D1					
3-methylheptane	0.48	0.46	2.4	6/7/2017	L,D1					
1,2-dibromoethane	0.01	0.40	1.2	6/7/2017	J,D1					
n-octane	1.1	0.38	2.4	6/7/2017	L,D1					
tetrachloroethylene	0.04	0.48	1.2	6/7/2017	J,D1					
chlorobenzene	ND	0.54	1.2	6/7/2017	D1					
ethylbenzene	ND	0.54	2.4	6/7/2017	D1					
m & p-xylene	0.50	0.54	4.8	6/7/2017	J,D1					
styrene	ND	0.54	2.4	6/7/2017	D1					
1,1,2,2-tetrachloroethane	ND	0.40	1.2	6/7/2017	D1					
o-xylene	0.08	0.54	2.4	6/7/2017	J,D1					
n-nonane	0.32	0.44	1.2	6/7/2017	J,D1					
isopropylbenzene	ND	0.48	1.2	6/7/2017	D1					
n-propylbenzene	ND	0.54	1.2	6/7/2017	D1					
m-ethyltoluene	0.02	0.22	1.2	6/7/2017	J,D1					
p-ethyltoluene	ND	0.32	2.4	6/7/2017	D1					
1,3,5-trimethylbenzene	ND	0.50	2.4	6/7/2017	D1					
o-ethyltoluene	0.01	0.26	2.4	6/7/2017	J,D1					
1,2,4-trimethylbenzene	0.06	0.54	1.2	6/7/2017	J,D1					
n-decane	0.10	0.54	2.4	6/7/2017	J,D1					
1,2,3-trimethylbenzene	0.02	0.54	1.2	6/7/2017	J,D1					
m-diethylbenzene	ND	0.54	2.4	6/7/2017	D1					
p-diethylbenzene	ND	0.54	1.2	6/7/2017	D1					
n-undecane	0.06	0.54	2.4	6/7/2017	J,D1					

Laboratory Analysis Results

Request Number: 1706001

Analysis Code: AP001VOC

Qualifier Notes:

ND - not detected
NQ - concentration can not be quantified due to possible interferences or coelutions.
SDL - Sample Detection Limit (Limit of Detection adjusted for dilutions).
SQL - Sample Quantitation Limit (Limit of Quantitation adjusted for dilution).
INV - Invalid.
J - Reported concentration is below SDL.
L - Reported concentration is at or above the SDL, and is below the lower limit of quantitation.
E - Reported concentration exceeds the upper limit of instrument calibration.
M - Result modified from previous result.
T - Data was not confirmed by a confirmational analysis. Compound and/or results is tentatively identified.
F - Established acceptance criteria was not met due to factors outside the laboratory's control.
H - Not all associated hold time specifications were met. Data may be biased.
C - Sample received with a missing or broken custody seal.
R - Sample received with a missing or incomplete chain of custody.
I - Sample received without a legible unique identifier.
G - Sample received in an improper container.
U - Sample received with insufficient sample volume.
W - Sample received with insufficient preservation.

Quality control notes for AP001VOC samples.

D1-Sample concentration was calculated using a dilution factor of 4.01.

TCEQ laboratory customer support may be reached at Frank.Martinez@tceq.texas.gov

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Table 1. Comparison of Monitored Concentrations in Lab Sample 1706001-001 to TCEQ Short-Term AMCVs

Lab Sample ID	1706001-001					
Compound	Odor AMCV (ppbv)	Short-Term Health AMCV (ppbv)	SQL (ppbv)	Concentrations (ppbv)	Flags	SDL (ppbv)
1,1,1-Trichloroethane	--	1,700	1.2	0.01	J,D1	0.52
1,1,2,2-Tetrachloroethane	--	10	1.2	ND	D1	0.4
1,1,2-Trichloroethane	--	100	1.2	ND	D1	0.42
1,1-Dichloroethane	--	1,000	1.2	ND	D1	0.38
1,1-Dichloroethylene	--	180	1.2	ND	D1	0.36
1,2,3-Trimethylbenzene	--	3000	1.2	0.02	J,D1	0.54
1,2,4-Trimethylbenzene	--	3000	1.2	0.06	J,D1	0.54
1,2-Dibromoethane	--	0.5	1.2	0.01	J,D1	0.4
1,2-Dichloroethane	--	540	1.2	ND	D1	0.54
1,2-Dichloropropane	--	100	1.2	ND	D1	0.34
1,3,5-Trimethylbenzene	--	3000	2.4	ND	D1	0.5
1,3-Butadiene	230	1,700	1.2	ND	D1	0.54
1-Butene	--	27,000	1.2	0.2	J,D1	0.4
1-Pentene	100	12,000	1.2	ND	D1	0.54
2,2,4-Trimethylpentane	--	4,100	1.2	0.04	J,D1	0.48
2,2-Dimethylbutane (Neohexane)	--	1,000	1.2	0.05	J,D1	0.42
2,3,4-Trimethylpentane	--	4,100	2.4	0.02	J,D1	0.48
2,3-Dimethylbutane	--	990	2.4	0.1	J,D1	0.56
2,3-Dimethylpentane	--	8,300	1.2	0.15	J,D1	0.52
2,4-Dimethylpentane	--	8,300	2.4	0.08	J,D1	0.54
2-Chloropentane (as chloroethane)	--	240	1.2	ND	D1	0.54
2-Methyl-1-Pentene +1-Hexene	--	490	4.8	ND	D1	0.4
2-Methyl-2-Butene	--	12,000	1.2	ND	D1	0.46
2-Methylheptane	--	4,100	2.4	0.83	L,D1	0.4
2-Methylhexane	--	8,300	1.2	0.89	L,D1	0.54

Lab Sample ID	1706001-001					
Compound	Odor AMCV (ppb _v)	Short-Term Health AMCV (ppb _v)	SQL (ppb _v)	Concentrations (ppb _v)	Flags	SDL (ppb _v)
2-Methylpentane (Isohexane)	--	990	1.2	0.94	L,D1	0.54
3-Methyl-1-Butene	100	7,700	1.2	ND	D1	0.46
3-Methylheptane	--	4,100	2.4	0.48	L,D1	0.46
3-Methylhexane	--	8,300	1.2	0.85	L,D1	0.4
3-Methylpentane	--	1,000	1.2	0.68	L,D1	0.46
4-Methyl-1-Pentene (as hexene)	--	490	2.4	ND	D1	0.44
Acetylene	--	25,000	2.4	ND	T,D1	1
Benzene	--	180	1.2	0.2	J,D1	0.54
Bromomethane (methyl bromide)	--	30	1.2	ND	D1	0.54
c-1,3-Dichloropropylene	--	9.9	1.2	ND	D1	0.4
c-2-Butene	--	15,000	1.2	ND	D1	0.54
c-2-Hexene	--	490	2.4	ND	D1	0.54
c-2-Pentene	--	12,000	2.4	ND	D1	0.5
Carbon Tetrachloride	--	20	1.2	0.09	J,D1	0.54
Chlorobenzene (phenyl chloride)	--	100	1.2	ND	D1	0.54
Chloroform (trichloromethane)	--	20	1.2	ND	D1	0.42
Cyclohexane	--	1,000	1.2	0.71	L,D1	0.48
Cyclopentane	--	5,900	1.2	0.08	J,D1	0.54
Cyclopentene	--	2,900	1.2	ND	D1	0.4
Dichlorodifluoromethane	--	10,000	1.2	0.5	L,D1	0.4
Ethane	--	*Simple Asphyxiant	2.4	16	T,D1	1
Ethylbenzene	--	20,000	2.4	ND	D1	0.54
Ethylene	--	500,000	2.4	ND	T,D1	1
Isobutane	--	33,000	2.4	0.88	L,D1	0.46
Isopentane (2-methylbutane)	--	68,000	4.8	0.87	L,D1	0.54
Isoprene	47	20	1.2	0.08	J,D1	0.54

Lab Sample ID	1706001-001					
Compound	Odor AMCV (ppb _v)	Short-Term Health AMCV (ppb _v)	SQL (ppb _v)	Concentrations (ppb _v)	Flags	SDL (ppb _v)
Isopropylbenzene (cumene)	130	510	1.2	ND	D1	0.48
m & p-Xylene (as mixed isomers)	--	1,700	4.8	0.5	J,D1	0.54
m-Diethylbenzene	--	450	2.4	ND	D1	0.54
Methyl Chloride (chloromethane)	--	500	1.2	0.6	L,D1	0.4
Methylcyclohexane	--	4,000	2.4	1.4	L,D1	0.52
Methylcyclopentane	--	750	2.4	0.5	J,D1	0.54
Methylene Chloride (dichloromethane)	--	3,400	1.2	0.07	J,D1	0.28
m-Ethyltoluene	--	250	1.2	0.02	J,D1	0.22
n-Butane	--	92,000	2.4	1.5	L,D1	0.4
n-Decane	--	1,750	2.4	0.1	J,D1	0.54
n-Heptane	--	8,300	2.4	1.6	L,D1	0.5
n-Hexane	--	1,700	2.4	1.9	L,D1	0.4
n-Nonane	--	3,000	1.2	0.32	J,D1	0.44
n-Octane	--	4,100	2.4	1.1	L,D1	0.38
n-Pentane	--	68,000	4.8	1.1	L,D1	0.54
n-Propylbenzene	--	510	1.2	ND	D1	0.54
n-Undecane	--	550	2.4	0.06	J,D1	0.54
o-Ethyltoluene	--	250	2.4	0.01	J,D1	0.26
o-Xylene	--	1,700	2.4	0.08	J,D1	0.54
p-Diethylbenzene	--	450	1.2	ND	D1	0.54
p-Ethyltoluene	--	250	2.4	ND	D1	0.32
Propane	--	*Simple Asphyxiant	2.4	6	T,D1	1
Propylene	--	*Simple Asphyxiant	2.4	ND	T,D1	1
Styrene	26	5,200	2.4	ND	D1	0.54
t-1,3-Dichloropropylene	--	9.9	1.2	ND	D1	0.4
t-2-Butene	--	15,000	1.2	ND	D1	0.36

Lab Sample ID	1706001-001					
Compound	Odor AMCV (ppbv)	Short-Term Health AMCV (ppbv)	SQL (ppbv)	Concentrations (ppbv)	Flags	SDL (ppbv)
t-2-Hexene	--	490	2.4	ND	D1	0.54
t-2-Pentene	--	12,000	2.4	ND	D1	0.54
Tetrachloroethylene	--	1,000	1.2	0.04	J,D1	0.48
Toluene	--	4,000	1.2	0.57	L,D1	0.54
Trichloroethylene	--	100	1.2	0.01	J,D1	0.58
Trichlorofluoromethane	--	10,000	1.2	0.22	J,D1	0.58
Vinyl Chloride	--	27,000	1.2	ND	D1	0.34

*A simple asphyxiant displaces air, lowering the partial pressure of oxygen and causing hypoxia at sufficiently high concentrations.

ppbv - Parts per billion by volume.

ND - Not detected.

NQ - Concentration can not be quantified due to possible interferences or coelutions.

SDL - Sample Detection Limit (Limit of Detection adjusted for dilution).

SQL - Sample Quantitation Limit (Limit of Quantitation adjusted for dilution).

INV - Invalid.

J - Reported concentration is below SDL.

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C - Sample received with a missing or broken custody seal.

R - Sample received with a missing or incomplete chain of custody.

I - Sample received without a legible unique identifier.

G - Sample received in an improper container.

U - Sample received with insufficient sample volume.

W - Sample received with insufficient preservation.

D1 - Sample concentration was calculated using a dilution factor of 4.01.

Table 2. TCEQ Long-Term Air Monitoring Comparison Values (AMCVs)

Please Note: The long-term AMCVs are provided for informational purposes only because it is scientifically inappropriate to compare short-term monitored values to the long-term AMCV.

Compound	Long-Term Health AMCV (ppb _v)	Compound	Long-Term Health AMCV (ppb _v)
1,1,1-Trichloroethane	930	Cyclopentane	590
1,1,2,2-Tetrachloroethane	1	Cyclopentene	290
1,1,2-Trichloroethane	10	Dichlorodifluoromethane	1,000
1,1-Dichloroethane	100	Ethane	*Simple Asphyxiant
1,1-Dichloroethylene	86	Ethylbenzene	440
1,2,3-Trimethylbenzene	37	Ethylene**	5,300
1,2,4-Trimethylbenzene	37	Isobutane	10,000
1,2-Dibromoethane	0.05	Isopentane (2-methylbutane)	8,100
1,2-Dichloroethane	0.72	Isoprene	2
1,2-Dichloropropane	10	Isopropylbenzene (cumene)	51
1,3,5-Trimethylbenzene	37	m & p-Xylene (as mixed isomers)	140
1,3-Butadiene	9	m-Diethylbenzene	46
1-Butene	2300	Methyl Chloride (chloromethane)	50
1-Pentene	560	Methylcyclohexane	400
2,2,4-Trimethylpentane	380	Methylcyclopentane	75
2,2-Dimethylbutane (Neohexane)	100	Methylene Chloride (dichloromethane)	100
2,3,4-Trimethylpentane	380	m-Ethyltoluene	25
2,3-Dimethylbutane	99	n-Butane	10,000
2,3-Dimethylpentane	2,200	n-Decane	175
2,4-Dimethylpentane	2,200	n-Heptane	2,200
2-Chloropentane (as chloroethane)	24	n-Hexane	190
2-Methyl-1-Pentene +1-Hexene	49	n-Nonane	280

Compound	Long-Term Health AMCV (ppb _v)	Compound	Long-Term Health AMCV (ppb _v)
2-Methyl-2-Butene	560	n-Octane	380
2-Methylheptane	380	n-Pentane	8,100
2-Methylhexane	2,200	n-Propylbenzene	51
2-Methylpentane (Isohexane)	99	n-Undecane	55
3-Methyl-1-Butene	770	o-Ethyltoluene	25
3-Methylheptane	380	o-Xylene	140
3-Methylhexane	2,200	p-Diethylbenzene	45
3-Methylpentane	100	p-Ethyltoluene	25
4-Methyl-1-Pentene (as hexene)	49	Propane	*Simple Asphyxiant
Acetylene	2,500	Propylene	*Simple Asphyxiant
Benzene	1.4	Styrene	110
Bromomethane (methyl bromide)	3	t-1,3-Dichloropropylene	0.99
c-1,3-Dichloropropylene	0.99	t-2-Butene	700
c-2-Butene	700	t-2-Hexene	49
c-2-Hexene	49	t-2-Pentene	560
c-2-Pentene	560	Tetrachloroethylene***	3.8
Carbon Tetrachloride	2	Toluene	1,100
Chlorobenzene (phenyl chloride)	10	Trichloroethylene	10
Chloroform (trichloromethane)	2	Trichlorofluoromethane	1,000
Cyclohexane	100	Vinyl Chloride	0.47

*A simple asphyxiant displaces air, lowering the partial pressure of oxygen and causing hypoxia at sufficiently high concentrations.

**Long-term vegetation AMCV for Ethylene is 30 ppb.

***Long-term vegetation AMCV for Tetrachloroethylene is 12 ppb.